E6 cmd'd layer are at the same potential; and said at least one winding being directly connectable to the transmission or distribution network.

REMARKS

This Amendment is in response to the Official Action of April 16, 2001, wherein the Examiner objected to certain claims for technical reasons. In particular, the Examiner objected to claim 33 as being in improper dependent form. The claim has been amended in order to specify the construction of the machine forming a component of the plant.

Claims 24 and 25 deal with different systems and are believed to thereby provide additional structure. Claim 24 recites a single machine without a transformer and claim 35 recites multiple machines with a system transformer.

The Examiner objected to the term "electrical contact" with respect to the contact between the conductor and the covering. The term has been changed to conform with the language set forth in claim 6 as originally filed.

The Examiner's rejection of the claims is respectfully traversed for the reasons set forth below.

The Examiner cited Titus (U.S. Patent No. 5,550,410) in view of Elton (U.S. Patent No. 4,853,565) and Takaoka (U.S. Patent No. 5,094,703). Titus merely shows a conventional high current, low voltage gas/turbine generator. It is not a machine of the type claimed.

Elton '565 fails to suggest or teach the use of high voltage cable in a dynamo-electric machine. Applicants are aware of the Abstract in Elton '565. However, Elton does not teach or suggest that the cable disclosed in Elton '565 could be the winding of the machine.

Further, Elton does not teach that a power cable for transmission and distribution of electricity could be the winding of a machine. The Abstract in Elton says "The insulated

conductor may be windings of a dynamo-electric machine." The Abstract of Elton '565 is not directed to the cable embodiment. Likewise, the Background does not even remotely suggest a correlation between machine and power cable. While the Elton '565 patent relates to power cables, in one embodiment, it does not suggest that power cables having a pyrolized glass layer could be a substitute for rigid conductors in a machine made with pyrolized grounding tape. The foregoing arguments also apply to Elton (U.S. Patent No. 5,036,165) as well.

Elton '165 describes a high voltage cable having an inner layer of semiconducting pyrolyzed glass fiber material and an outer layer of the same material in which the outer layer is grounded. Once the teaching of Elton is fully considered and viewed as a whole, it will be apparent that Elton does not show or suggest the invention alone or in combination with any of the references cited. Even though it is suggested in Elton to apply a semi-conducting layer in the form of a pyrolyzed glass tape to a winding in a dynamo-electric machine, and to apply such a layer in a power cable, there is no indication that the use of such a cable would be useful in a dynamo-electric machine. Indeed, the disclosure of Elton '165 stems from the parent Elton, U.S. Patent 4,835,565 cited by the Examiner, as noted above, which describes three different applications for a semiconducting layer. One application is for using a pyrolyzed glass tape in a layer in conventional winding or armature bars in a known high current, low voltage dynamo-electric machine. A second application set forth in the parent of Elton '565 is for a housing to reduce electric discharge in an enclosed circuit. Finally, Elton '565 employs a semiconducting pyrolyzed glass layer in a conventional cable. However, there is no proposal to use the cable shown in Elton '565 in a dynamo-electric machine. It is only the semi-conducting tape that is used in a dynamo-electric machine. The arrangement of Elton does not provide a solid insulating system as described and disclosed in the present invention.

The bar forming the conductor in Elton '565 has square corners. As a result, the field is highly concentrated in the corners and would not be equalized, but would exhibit peaks in these regions. In order to truly equalize the potential in the arrangement of Elton '565 using rectangular conductors, one would have to provide a thick layer of the pyrolized glass material and add other features rendering the design impractical for a machine. Also, Elton '565 is not a high voltage arrangement, because high voltage in machines is different than high voltage in the power transmission and distribution context.

It is clear that Elton describes the use of a semi-conducting layer as a grounding tape around conventional insulated electrical windings or armature bars which are disposed in the slots of a conventional machine. Elton '565 discusses the use of an insulated conductor in the winding of a dynamo-electric machine. The conductor is a conventional rigid bar, not a cable.

The Abstract of Elton '165 is identical to the Abstract of the parent, Elton '165, which discloses the three different and diverse applications for semi-conducting pyrolyzed glass fiber. Nowhere does the parent Elton et al. suggest that the cable described in the specification could be used for such purpose. It is only later in Elton '165 that a high-voltage cable is described, and without suggesting that the cable could be used as the winding in the dynamo-electric machine.

In view of the differences in operation and applications between conventional armature windings that use pyrolyzed glass tape and a power cable that also uses pyrolyzed glass tape, one of ordinary skill in the power generation art would not have been motivated at the time the invention was made to substitute the power cable for the winding since the prevailing thought at the time was that cable wound electric machines would not operate successfully at high voltage. Furthermore, Elton itself does not teach or suggest the substitution but merely provides yet another indication that those of ordinary skill in the power industry would

recognize windings as being in a different field of endeavor than power cables. Elton merely describes that the pyrolyzed glass tape may be used in these two different fields of endeavor, namely, windings in electric machines and also in power cables. It does not suggest that a winding for a machine and a high voltage cable are interchangeable. Thus, it is believed that neither Elton '565 nor '165 have any applicability to the arrangement described in the present invention.

There is no suggestion that the conventional winding of Elton '565 having a semiconducting grounding tape could be modified by substitution of the cable of the invention. The reference simply employs a semi-conductive material in conventional machine winding and in a cable structure. Elton does not disclose that it would be useful to use the cable as the winding. This is because, for a given power level P+E·I, where P=power, E=voltage, and I=current, when the voltage is high the voltage is subsequently low and vice-versa. As such, the conductor in a high voltage machine according to the invention can be flexible and have a relatively small cross section (as in cable). Such conductor need not have a capability of carrying a high current. In a conventional high power machine in which current is high and the voltage is relatively low, the conductors are formed of shaped, rigid, high cross-sectional area copper bars. The problems associated with high current operation typically involve thermal considerations, whereas at high voltage, insulation breakdown is a predominant failure mode.

Thus, it is not obvious to combine an essentially high voltage device, such as a power cable in a high current device, as a high power machine. It is not merely the fact that the voltage in one machine is much higher than the other, it is that the problems associated with high voltage operation are entirely different from problems associated with high current operation, and the focus of the designer is thus entirely different.

Also, it should be noted that Elton describes a rigid pyrolyzed glass grounding tape. The tape is formed in a curable resin which cures rigidity. Therefore, if bent, the pyrolyzed glass tape will crack, forming voids and the resin will crack, forming voids as well. The voids promote a further failure mode, known as partial discharge. Even if the pyrolyzed glass is chipped, the hard resin layer remains rigid and subject to cracking and then is failure prone.

Takaoka is simply a conventional able. Takaoka simply discloses a power cable construction and more particularly, a large size conductor for large capacity having good characteristics in the skin effect coefficient, the withstanding voltage and the minimum winding ratio. According to Takaoka, the purpose of the oxide coating is to increase power transmission capability by reducing the skin effect. Obviously, this comes into effect over large distances. In the present invention, the length of the cable winding is not so large that such an effect would necessarily be a problem. According to one embodiment in high voltage, high magnetic flux machines, the conductors may be insulated from each other in order to reduce eddy current losses between the conductors. However, it is not absolutely necessary for the individual strands to be mutually insulated. Likewise, it has been found that when at least one of the conductors is insulated and in contact with the covering, a predictable equipotential surface is formed adjacent to and surrounds the conductor.

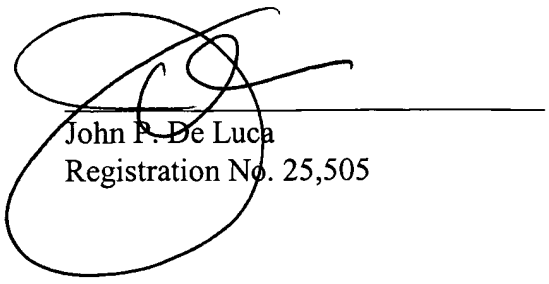
In summary, none of the cited references, either alone or in combination, shows an arrangement which does not suffer from at least one important defect, namely: the inability to confine the electric field; unacceptable field peaks; unacceptable heat concentration, *i.e.*, high cooling demand; excessive eddy currents; and too high or too low a resistivity of the inner and outer layers.

The claims, as amended, are believed to be fully distinguished over the art of record.

It is therefore respectfully requested that the Examiner reconsider the rejection of the claims, the allowance of which is earnestly solicited.

If filing this paper or any accompanying papers necessitates additional fees not otherwise provided for, the undersigned authorizes the Commissioner to deduct such additional fees from Deposit Account No. 04-2223.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claim 1. (Thrice Amended) A hydrogenerator plant for connection to a high voltage transmission or distribution network comprising: at least one rotating electric machine for high voltage coupled to a turbine via shaft means, said electric machine comprising at least one winding [comprising] formed of a conductor including a plurality of insulated conductive [strands] elements, and at least one insulated conductive [strand] element; a [solid insulation] covering surrounding the [conductors] conductor including an inner layer having semiconducting properties, a solid insulating layer surrounding the inner layer and an outer layer having semiconducting properties surrounding the insulating layer, said inner layer being in [electrical] contact with the uninsulated [strand] element such that the inner layer has the same potential as the conductor, and said at least one winding being directly connectable to the transmission or distribution network, the voltages being across a range of transmission or distribution voltages.

Claim 2. (Amended) The plant as claimed in claim 1 wherein the [winding includes an insulation system comprising] at least two semiconducting layers[,] each [layer constituting] form essentially an equipotential surface, and [also intermediate solid insulation] wherein at least one of the layers has substantially the same coefficient of thermal expansion as the solid insulation.

Claim 5. (Thrice Amended) The plant as claimed in claim 1 wherein the winding comprises a cable [and the solid insulation covering comprises inner and outer semiconducting layers and an intermediate insulating layer of solid insulation surrounding the conductors].

Claim 6. (Amended) The plant as claimed in claim [5] 1, wherein the inner semiconducting layer is at substantially the same potential as the conductors.

Claim 7. (Amended) The plant as claimed in claim [5] 1, wherein the outer semiconducting layer forms an equipotential surface surrounding the conductors.

Claim 10. (Amended) The plant as claimed in claim [5] 1, wherein at least two of said layers have substantially the same coefficient of thermal expansion.

Claim 13. (Amended) The plant as claimed in claim [12] 1, wherein the cable also comprises a metal screen and a sheath.

Claim 22. (Amended) The plant as claimed in claim [5] 1, wherein the cable has a conductor area of about between 40 and 3000 mm^2 and an outer cable diameter of about between 20 and 250 mm.

Claim 33. (Thrice Amended) [A procedure for constructing a] The plant as claimed in claim 1, wherein the electric machine includes a stator comprising [at least one of separate stator limitations and combined stacks] a plurality of stator limitations having openings for receiving the winding, said [parts] laminations being assembled into a stack with the openings aligned [on site], and the winding comprises a cable threaded into the openings or the stacking laminations of the stator [threading of the winding and any splicing on site] at the manufacturing facility or at the generation plant site.

Claim 34. (Amended) An electric generator for high voltage included in a hydro-generator plant in which the generator is coupled to a turbine via shaft means, said generator comprising at least one winding including a conductor, a solid insulation covering including an inner layer having semiconducting properties; a solid insulating layer surrounding the inner layer and [at least one semiconducting] an outer layer having semiconducting properties surrounding [said conductor] the insulation layer; and wherein each winding is directly connectable to a high voltage transmission or distribution network, and the inner layer forms an equipotential surface about the conductor.

Claim 37. (Amended) A hydrogenerator plant including a rotating high voltage electric machine comprising a stator; a rotor and a winding, wherein said winding comprises a cable including a current-carrying conductor and a magnetically permeable, electric field confining cover surrounding the conductor, including an inner layer having semiconducting properties, a solid insulation surrounding the inner layer and an outer layer having semiconducting properties surrounding the solid insulation, said cable forming at least one uninterrupted turn in the corresponding winding of said machine, and wherein the conductor includes a plurality of insulated conductive strands and at least one uninsulated electrically conductive strand in contact with the [cover] inner layer, such that said conductive and insulating layer at the same potential.

Claim 38. (Amended) The hydrogenerator plant of claim 37, wherein the [cover comprises an insulating layer surrounding the conductor and an outer layer surrounding the

insulating layer, said] outer layer [having] has a conductivity sufficient to establish an equipotential surface around the conductor.

Cancel claims 39 and 40.

Claim 50. (Amended) A hydrogenerator plant for direct connection to a high voltage transmission or distribution network comprising: at least one rotating electric machine for high voltage coupled to a turbine via shaft means, said electric machine [comprising] including at least one winding comprising a conductor and a magnetically permeable, electric field confining insulating covering surrounding the conductor including an inner layer having semiconducting properties, a solid insulation surrounding the inner layer and an outer layer having semiconducting properties surrounding the insulating layer, said conductor including at least one of a plurality of insulated conductive elements, and at least one insulated conductive element being in contact with the inner layer such that said conductor and inner layer are at the same potential; [a solid insulation covering surrounding the conductors and in electrical contact with the uninsulated element] and said at least one winding being directly connectable to the transmission or distribution network.